

## Scope of this document

This application note is intended for MATLAB users who want to set up their first vision application. The following topics are included:

- Installing the required Vimba and MATLAB components
- Configuring your camera and acquiring the first images with MATLAB's Image Acquisition Tool

Image Acquisition Tool is a viewer application that helps adjust camera parameters without any programming. Moreover, Image Acquisition Tool automatically creates code that you can paste into the MATLAB program. Image Acquisition Tool is optimized for quick and easy camera configuration, not for best performance.

## Compatibility

### Allied Vision cameras and Vimba SDK

MATLAB is compatible with Allied Vision GigE, USB, and 1394 cameras. Accessing the cameras via Vimba's GenICam-compliant transport layers and MATLAB's GenICam interface ensures a stable performance.

## Required host adapter cards

Using a separate host adapter card for your camera is highly recommended. Especially with GigE cameras, a separate NIC ensures optimal performance and helps avoid conflicts with your firewall or anti-virus software.

**GigE hardware selection:** [http://www.alliedvision.com/fileadmin/content/documents/products/cameras/various/appnote/GigE/Hardware\\_Selection\\_for\\_Allied\\_Vision\\_GigE\\_Cameras.pdf](http://www.alliedvision.com/fileadmin/content/documents/products/cameras/various/appnote/GigE/Hardware_Selection_for_Allied_Vision_GigE_Cameras.pdf)

**Hardware for USB and 1394 cameras:** Read the instructions in the technical manual or user guide for your camera.

## Required Vimba and MATLAB components

To program a vision application with MATLAB and Allied Vision cameras, you need:

- Vimba SDK (install at least the transport layers and the camera drivers)
- MATLAB R2014a or higher, including Image Acquisition Toolbox
- MATLAB's GenICam interface, which is available as MATLAB support package and free of charge for Image Acquisition Toolbox users.

You can install Vimba either before or after installing the MATLAB components. Vimba automatically sets the required Gentl environment variable and automatically connects with MATLAB's GenICam interface.

## Installing Vimba

The following action steps apply to Windows.

1. Select, install, and configure your host adapter card as described in the corresponding manual for your camera (GigE: activate jumbo frames).
2. Download Vimba: <https://www.alliedvision.com/en/products/software.html>
3. Install Vimba. As a minimum, select the option **3rd Party Applications**.



Figure 1: Select 3rd Party Applications

- If you want to install the Vimba Viewer additionally (recommended for GigE camera users), click **Vimba Applications** and select Camera Demonstration.



Figure 2: Install Vimba Viewer

- Start the Vimba Driver Installer.
- Install and activate the Vimba driver for your camera (find a detailed description in the Vimba Manual, Chapter Vimba Driver Installer):

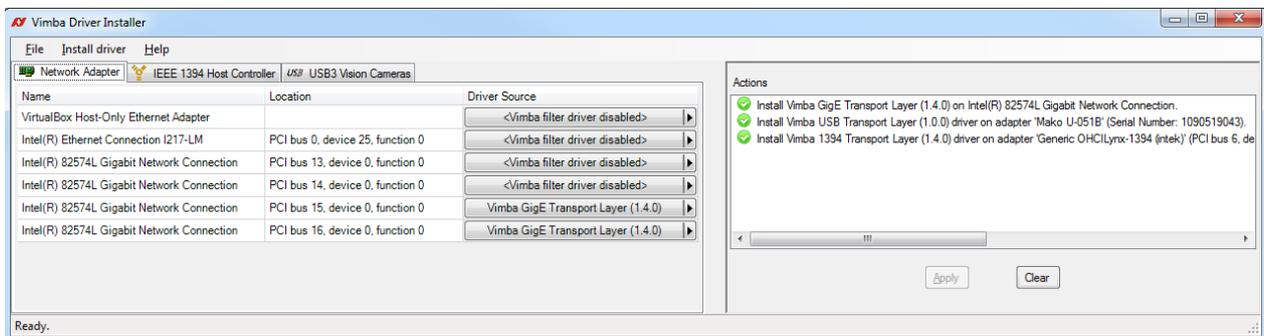


Figure 3: Vimba Driver Installer

Now you've installed all required Vimba components.

## Installing MATLAB's GenICam support package

### Prerequisites

MATLAB including Vision Acquisition Toolbox must be installed.

### Check if the GenICam support package is installed

Before you start programming your vision application, check if the GenICam support package is installed. We recommend using the GenICam support package instead of other options such as GigE Vision or DCAM.

To check if MATLAB's GenICam support package is installed:

1. Start MATLAB and click the **APPS** tab.
2. Click **Image Acquisition**.

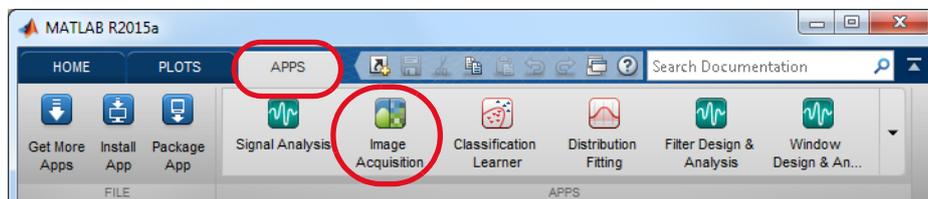


Figure 4: Tab APPS -> Image Acquisition

3. Image Acquisition Tool opens in a new window.

### Scenario a)

The Hardware Browser window shows your camera(s) with suffix (gentl-1, gentl-2, gentl-3...).

This means that the MATLAB GenICam interface is already installed. Proceed as described in section [Getting the first images](#).

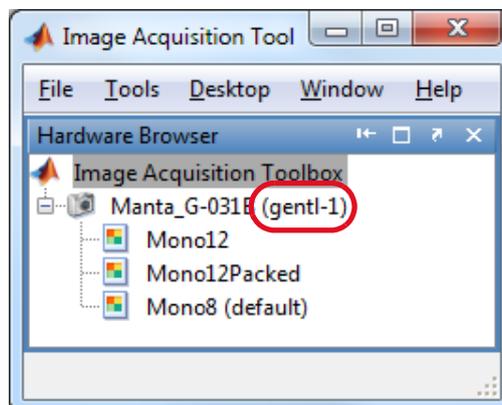


Figure 5: Hardware Browser lists camera with suffix (gentl)

## Scenario b)

The Hardware Browser either doesn't show your camera at all or it shows the camera with a different suffix than (*gentl*), for example, with suffix (*gige*) or (*dcam*). This means that you either have to initiate a refresh or the GenICam support package is missing.

### Refreshing Image Acquisition Toolbox

1. In the Hardware Browser, select **Image Acquisition Toolbox**.
2. Select **Tools -> Imaqreset**.

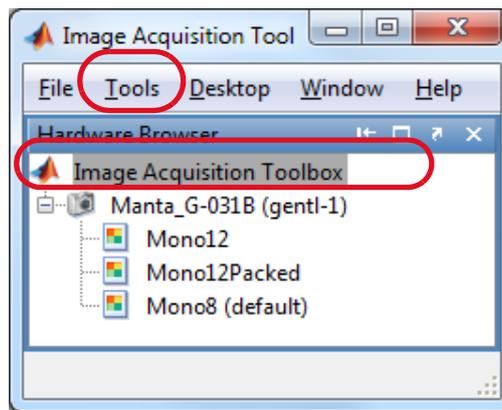


Figure 6: Initiate a refresh

## Installing the GenICam support package

If **no camera is listed**, go to the MATLAB window (under the Image Acquisition Toolbox window) and click the link in the error message to download and install the GenICam support package.

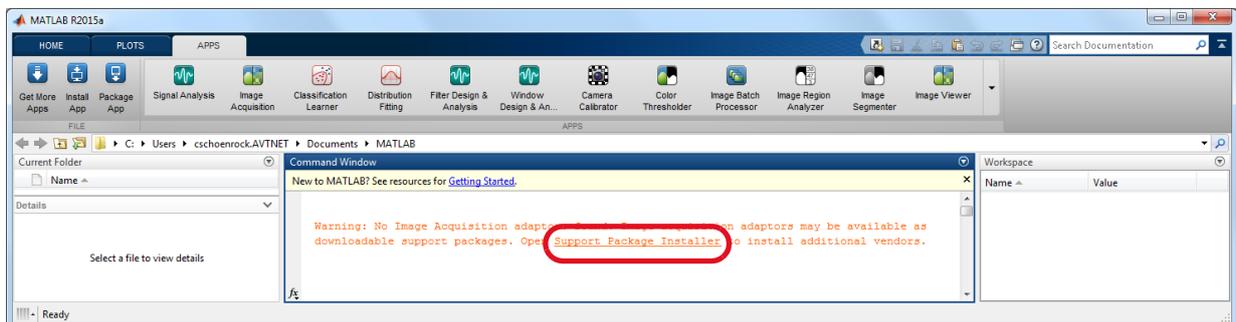


Figure 7: Click the link to download the GenICam support package

If your **camera is listed with the wrong suffix** or the **link does not appear** in the Command Window, install the GenICam support package:

<http://www.mathworks.com/help/imaq/installing-the-support-packages-for-image-acquisition-toolbox-adaptors.html>

In the Support Package Installer, select **GenICam Interface**.

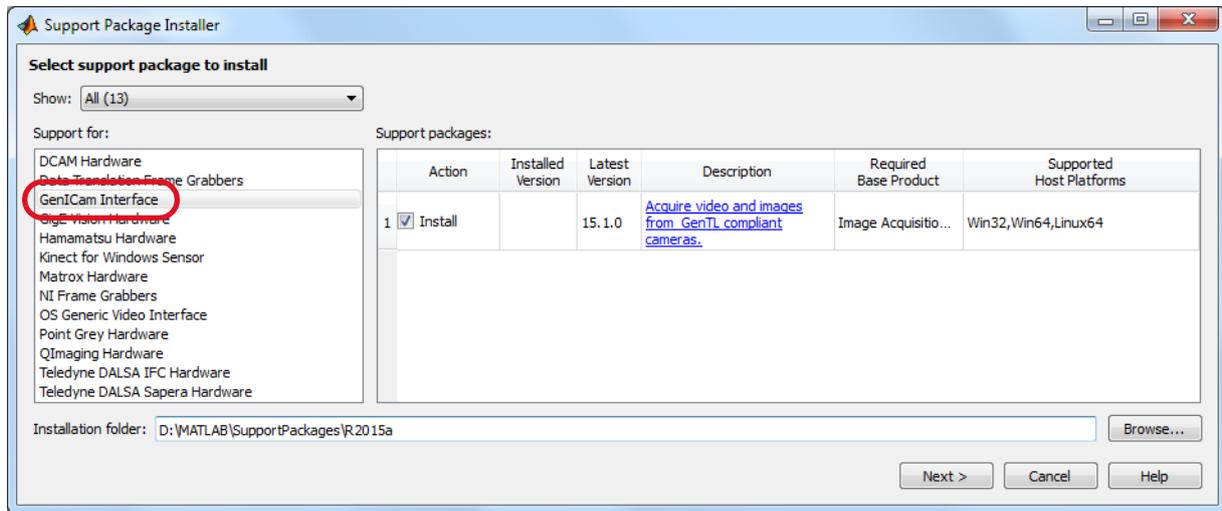


Figure 8: Select GenICam Interface

Now your PC is ready for image acquisition with MATLAB.

## Getting the first images

As soon as the GenICam support package is installed, the camera is listed with the (*gentl*) suffix and you can view or acquire images:

1. Select a device format, for example, Mono8.
2. Click **Start Preview**.

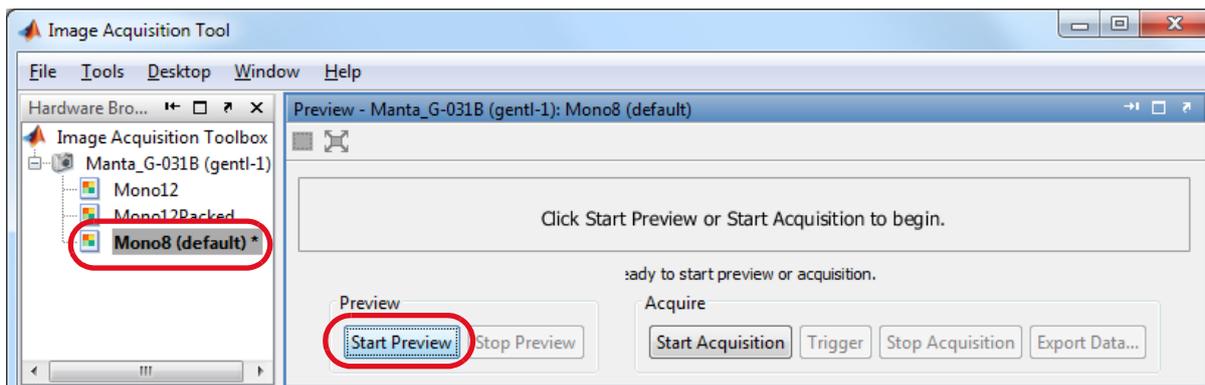


Figure 9: Select a device format and click Start Preview

Now you can see images from your Allied Vision camera and adjust its parameters.

## MATLAB image acquisition basics

### MATLAB's general camera handling

MATLAB handles cameras differently than most other machine vision applications: As soon as you have activated a device format (also called pixel format), MATLAB starts a background process that permanently accesses the camera, even if you have stopped image acquisition. This causes CPU load.

#### Device format

In Image Acquisition Tool, the device format (for example, Mono8 or BayerRG8) has a central role and is the starting point. Therefore, determine the appropriate device format at an early stage of the development phase.

#### Hardware trigger behavior

MATLAB's hardware trigger behavior is special and might not meet your expectations. To determine an exact moment of triggering, connect an external trigger source electrically to the camera.

In MATLAB, use the preselected hardware trigger source and trigger condition *DeviceSpecific*.

### Imaqreset command

The *imaqreset* command disconnects MATLAB from your camera and unloads the GenICam interface. You can also use it to search for new hardware. In Image Acquisition Toolbox, you can invoke it with a right-click in the Hardware Browser.

## Working with Image Acquisition Tool

In Image Acquisition Tool, click **Desktop** to select the windows you want to see and save your preferred layout.

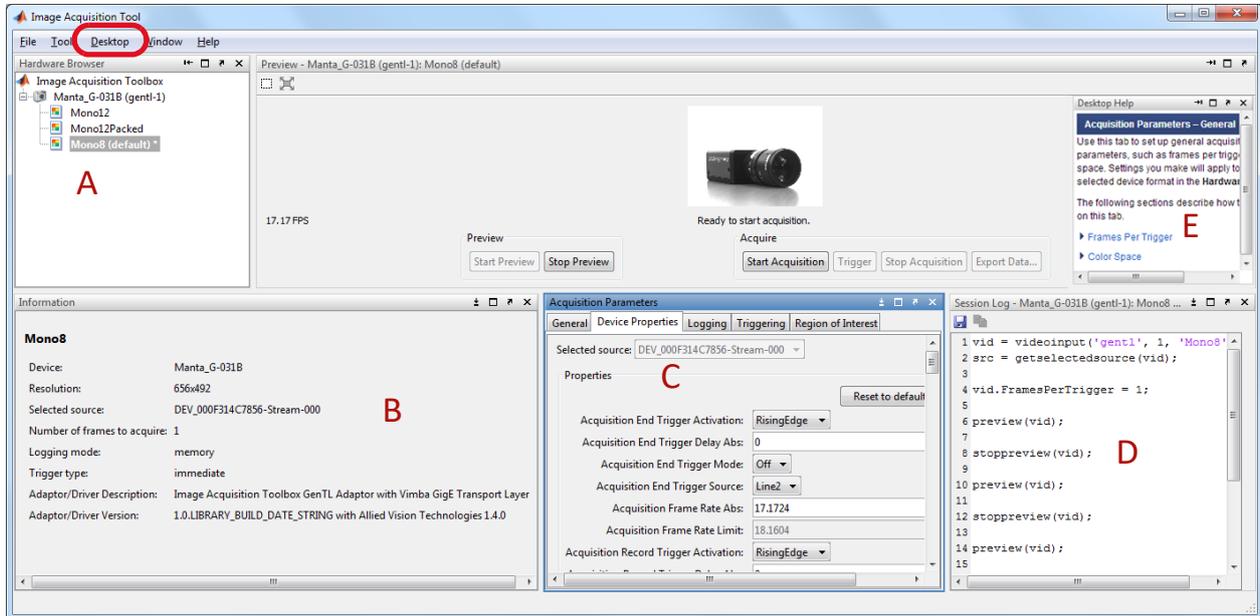


Figure 10: Desktop -> standard view

- The **Hardware Browser A** shows available cameras and device formats.
- **Information B** shows if the Vimba Transport layer is in use (select a device format).
- The **Acquisition Parameter** window **C** gives access to all camera features except for the device format.
- **Session Log D** automatically creates code based on your activities within Image Acquisition Tool. Use session log to easily create code and paste it into the MATLAB Command Window.
- **Desktop Help E** gives information on currently selected items.



### Save your camera configuration

The current camera configuration is lost with every *imagreset* and program shutdown.

Select **File -> Save Configuration** to retrieve your settings later.

The configuration file is valid only for the device format it was created with, for example, Mono8. Configuration files cannot be opened under a different device format.

## Troubleshooting

- Before starting HDevelop, make sure no other application uses the camera.
- Camera recognition may take a while, especially with GigE cameras.
- Test if your camera works with Vimba Viewer. If not, check the settings of your GigE, 1394, or USB host adapter.
- GigE cameras: If your GigE camera is available in the hardware browser but does not acquire images, install Vimba Viewer and open the camera in Vimba Viewer. Then close Vimba Viewer and try again with Image Acquisition Toolbox. Moreover, use a separate NIC (see the MATLAB Help for configuration instructions), activate jumbo frames, and use CAT 6 (or higher) Ethernet cables.
- Open the Vimba Driver Installer and make sure the Vimba drivers are in use.
- If your camera does not reach the maximum frame rate, check if the exposure time is short enough. Example: If the exposure time is 100 ms, the camera cannot acquire more than approximately 10 fps.
- GigE cameras: Follow the instructions in the GigE Technical Manual.  
Follow the instructions in the HALCON documentation.

## Download technical documentation for your camera

### GigE cameras

- Technical Manual (contains installation instructions, camera-specific information, and technical data)
- GigE Features Reference (provides a general overview of GigE camera and driver features)

### USB cameras

- Alvium USB Cameras User Guide or Mako U Technical Manual (contains camera-specific information, installation instructions, and technical data)
- Features Reference for Alvium or Mako U (provides a general overview of USB camera and driver features)

### 1394 cameras

- 1394 Installation Manual (contains installation instructions and camera I/O descriptions)
- Technical Manual (contains camera-specific technical data and camera features)



### Download camera documentation

<https://www.alliedvision.com/en/support/technical-documentation.html>

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